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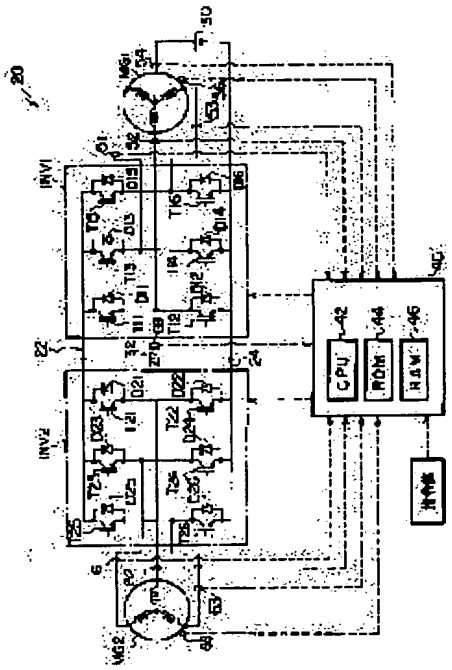
(54) POWER-OUTPUT UNIT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a way for outputting a power by individually driving a plurality of motors using a low DC voltage, and enhancing efficiency of a unit.
SOLUTION: A chargeable and dischargeable capacitor 32 is connected to a positive electrode busbar 22 and a negative electrode busbar 24 of inverter circuits INV1, INV2, and a DC power 30 is connected to the negative electrode busbar 24 and a neutral point of a motor MG1. Transistors T11 to T16 of the inverter circuit INV1 are switch-controlled based on a phase-voltage command value to which a DC component and an AC component are added. And also, an inter-terminal voltage of the capacitor 32 is controlled by the DC component using a voltage higher than that of the DC power 30, and the motor MG1 is drive-controlled by the AC component as well. Then, the motor MG2 is drive- controlled individually from the motor MG1 by switch-controlling transistors T21 to T26 of the inverter circuit INV2.



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CLAIMS

[Claim(s)]
[Claim 1] Polyphase current power by the 1st motor which carries out a rotation drive by the polyphase current, and switching actuation of two or more switching elements The 1st inverter circuit which can be supplied to said 1st motor, The 1st electric power supply means connected at the bus-bar of the either the positive-electrode bus-bar of this 1st inverter circuit or the negative-electrode bus-bars, and the neutral point of said 1st motor, A positive-electrode bus-bar and a negative-electrode bus-bar are connected to the 2nd motor which carries out a rotation drive by the polyphase current, and the positive-electrode bus-bar and negative-electrode bus-bar of said 1st inverter circuit. A power output unit equipped with an accumulation-of-electricity means in which charge and discharge are possible by which polyphase current power was connected to the 2nd inverter circuit which can be supplied to said 2nd motor, and the positive-electrode bus-bar and negative-electrode bus-bar of said 1st inverter circuit by switching actuation of two or more switching elements.
[Claim 2] A power output unit [equipped with the 1st drive accumulation-of-electricity control means which controls the accumulation-of-electricity condition of said accumulation-of-electricity means while carrying out drive control of said 1st motor] according to claim 1.
[Claim 3] Said 1st drive accumulation-of-electricity control means is a power output unit according to claim 2 which is a means to control switching of two or more of said switching elements of said 1st inverter circuit to adjust the charge and discharge of said accumulation-of-electricity means while adjusting said polyphase current impressed to said 1st motor.
[Claim 4] Said 1st drive accumulation-of-electricity control means is a power output unit according to claim 2 or 3 which is a means to control switching of two or more of said switching elements of said 1st inverter circuit so that the electrical potential difference between terminals of said accumulation-of-electricity means turns into a target electrical potential difference, while the polyphase current in which the output of target power is possible is impressed to this 1st motor from said 1st motor.
[Claim 5] There is no claim 1 equipped with the 2nd electric power supply means connected at the bus-bar of the either the positive-electrode bus-bar of said 2nd inverter circuit or the negative-electrode bus-bars and the neutral point of said 2nd motor, and it is the power output unit of a publication 4 either.
[Claim 6] A power output unit [equipped with the 2nd drive accumulation-of-electricity control means which controls the accumulation-of-electricity condition of said accumulation-of-electricity means while carrying out drive control of said 2nd motor] according to claim 5.
[Claim 7] Said 2nd drive accumulation-of-electricity control means is a power output unit according to claim 6 which is a means to control switching of two or more of said switching elements of said 2nd inverter circuit to adjust the charge and discharge of said accumulation-of-electricity means while adjusting said polyphase current impressed to said 2nd motor.
[Claim 8] Said 2nd drive accumulation-of-electricity control means is a power output unit according to claim 6 or 7 which is a means to control switching of two or more of said switching elements of said 2nd inverter circuit so that the electrical potential difference between terminals of said accumulation-of-electricity means turns into a target electrical potential difference, while the polyphase current in which the output of target power is possible is impressed to this 2nd motor from said 2nd motor.
[Claim 9] Polyphase current power by the 1st motor which carries out a rotation drive by the polyphase current, and switching actuation of two or more switching elements The 1st inverter circuit which can be supplied to said 1st motor, The 1st electric power supply means connected at the bus-bar of the either the positive-electrode bus-bar of this 1st inverter circuit or the negative-electrode bus-bars, and the neutral point of said 1st motor, A positive-electrode bus-bar and a negative-electrode bus-bar are connected to the 2nd

motor which carries out a rotation drive by the polyphase current, and the positive-electrode bus-bar and negative-electrode bus-bar of said 1st inverter circuit. Polyphase current power by switching actuation of two or more switching elements The 2nd inverter circuit which can be supplied to said 2nd motor, A power output unit equipped with the 1st accumulation-of-electricity means which was connected at the bus-bar of another side to which said 1st electric power supply means of the positive-electrode bus-bar of said 1st inverter circuit and the negative-electrode bus-bars was not connected, and the neutral point of said 1st motor and in which charge and discharge are possible.

[Claim 10] A power output unit [equipped with the 1st drive accumulation-of-electricity control means which controls the accumulation-of-electricity condition of said 1st accumulation-of-electricity means while carrying out drive control of said 1st motor] according to claim 9.

[Claim 11] Said 1st drive accumulation-of-electricity control means is a power output unit according to claim 10 which is a means to control switching of two or more of said switching elements of said 1st inverter circuit to adjust the charge and discharge of said 1st accumulation-of-electricity means while adjusting said polyphase current impressed to said 1st motor.

[Claim 12] Said 1st drive accumulation-of-electricity control means is a power output unit according to claim 10 or 11 which is a means to control switching of two or more of said switching elements of said 1st inverter circuit so that the electrical potential difference between terminals of said 1st accumulation-of-electricity means turns into a target electrical potential difference, while the polyphase current in which the output of target power is possible is impressed to this 1st motor from said 1st motor.

[Claim 13] Claim 9 thru/or the 2nd electric power supply means which is the power output unit of a publication 12 either, and was connected at the bus-bar of the either the positive-electrode bus-bar of said 2nd inverter circuit or the negative-electrode bus-bars, and the neutral point of said 2nd motor, A power output unit equipped with the 2nd accumulation-of-electricity means which was connected at the bus-bar of another side to which said 2nd electric power supply means of the positive-electrode bus-bar of said 2nd inverter circuit and the negative-electrode bus-bars was not connected, and the neutral point of said 2nd motor and in which charge and discharge are possible.

[Claim 14] A power output unit [equipped with the 2nd drive accumulation-of-electricity control means which controls the accumulation-of-electricity condition of said 2nd accumulation-of-electricity means while carrying out drive control of said 2nd motor] according to claim 13.

[Claim 15] Said 2nd drive accumulation-of-electricity control means is a power output unit according to claim 14 which is a means to control switching of two or more of said switching elements of said 2nd inverter circuit to adjust the charge and discharge of said 2nd accumulation-of-electricity means while adjusting said polyphase current impressed to said 2nd motor.

[Claim 16] Said 2nd drive accumulation-of-electricity control means is a power output unit according to claim 14 or 15 which is a means to control switching of two or more of said switching elements of said 2nd inverter circuit so that the electrical potential difference between terminals of said 2nd accumulation-of-electricity means turns into a target electrical potential difference, while the polyphase current in which the output of target power is possible is impressed to this 2nd motor from said 2nd motor.

[Claim 17] There is no claim 9 equipped with the 3rd accumulation-of-electricity means which was connected to said the 1st positive-electrode bus-bar and negative-electrode bus-bar of an inverter circuit and in which charge and discharge are possible, and it is the power output unit of a publication 16 either.

[Claim 18] There is no claim 1 and it is the power output unit of a publication 17 either. Said the 1st motor and/or said 2nd motor It is the generator motor which can be generated by the input of power. Said 1st electric power supply means It is the means in which charge and discharge are possible. While driving said the 1st motor and/or said 2nd motor as a generator A power output unit equipped with the 1st charge control means which controls switching of the switching element of said 1st inverter circuit and/or said 2nd inverter circuit to charge said 1st electric power supply means using the power generated by the motor driven as this generator.

[Claim 19] It is a power output unit according to claim 18 concerning claim 5 thru/or 8 or claim 13 thru/or 16. Said 2nd electric power supply means It is the means in which charge and discharge are possible. While driving said the 1st motor and/or said 2nd motor as a generator A power output unit equipped with the 2nd charge control means which controls switching of the switching element of said 1st inverter circuit and/or said 2nd inverter circuit to charge said 2nd electric power supply means using the power generated by the motor driven as this generator.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a power output unit.
[0002]
[Description of the Prior Art] Conventionally, the thing equipped with the DC power supply connected at the capacitor, the positive-electrode bus-bar of an inverter circuit or negative-electrode bus-bar connected to the positive-electrode bus-bar and negative-electrode bus-bar of the inverter circuit which impresses the three-phase alternating current to a motor as this kind of a power output unit, and the neutral point of a motor is proposed (for example, JP,10-337047,A, JP,11-178114,A, etc.). With this equipment, while regarding it as the pressure-up chopper circuit which carries out the pressure up of the electrical potential difference of DC power supply for the circuit which consists of a coil of each phase of a motor, and a switching element of each phase of an inverter, and stores a charge in a capacitor, it considers that this capacitor that it stored electricity is DC power supply, and a motor is driven. The switching operation of the switching element of the inverter circuit made in case the three-phase alternating current is impressed to a motor is performing drive control of a motor and accumulation-of-electricity control to a capacitor to coincidence.
[0003]
[Problem(s) to be Solved by the Invention] However, although an independent motor can be driven in such a power output unit using the DC power supply of a low battery, it is difficult to drive two or more motors independently using the DC power supply of a low battery.
[0004] The power output unit of this invention sets to drive two or more motors independently using the direct current voltage of a low battery, and to output power to one of the purposes. Moreover, the power output unit of this invention sets to attain efficient-ization of equipment to one of the purposes.
[0005]
[The means for solving a technical problem, and its operation and effectiveness] The power output unit of this invention took the following means, in order to attain a part of above-mentioned purpose [at least].
[0006] The 1st motor which the 1st power output unit of this invention is a power output unit in which the output of power is possible, and carries out a rotation drive by the polyphase current, Polyphase current power by switching actuation of two or more switching elements The 1st inverter circuit which can be supplied to said 1st motor, The 1st electric power supply means connected at the bus-bar of the either the positive-electrode bus-bar of this 1st inverter circuit or the negative-electrode bus-bars, and the neutral point of said 1st motor, A positive-electrode bus-bar and a negative-electrode bus-bar are connected to the 2nd motor which carries out a rotation drive by the polyphase current, and the positive-electrode bus-bar and negative-electrode bus-bar of said 1st inverter circuit. Let it be a summary to have an accumulation-of-electricity means in which charge and discharge are possible by which polyphase current power was connected to the 2nd inverter circuit which can be supplied to said 2nd motor, and the positive-electrode bus-bar and negative-electrode bus-bar of said 1st inverter circuit by switching actuation of two or more switching elements.
[0007] In the 1st power output unit of this this invention, while regarding it as the circuit which carries out the pressure up of the circuit which consists of the coil of each phase of the 1st motor and the switching element of each phase of the 1st inverter circuit which carry out a rotation drive by the polyphase current using the power of the 1st electric power supply means, and stores a charge in an accumulation-of-electricity means, it can be considered that this accumulation-of-electricity means is the DC power supply which can drive the 1st motor and 2nd motor. Namely, the circuit which consists of a coil of each phase of the 1st

motor and a switching element of each phase of the 1st inverter circuit can charge an accumulation-of-electricity means using the power of the 1st electric power supply means by switching actuation of the switching element of the 1st inverter circuit. While being able to perform charge of an accumulation-of-electricity means, and the drive of the 1st motor to coincidence by synchronizing with the switching actuation in the case of the drive of the switching actuation of the 1st motor The rotation drive of the 2nd motor can be carried out by switching actuation of the switching element of the 2nd inverter circuit using the power stored in the accumulation-of-electricity means. And since switching actuation of the 1st inverter circuit and switching actuation of the 2nd inverter circuit can be performed independently, the 1st motor and 2nd motor can be driven independently. That is, two or more motors can be independently driven using the electric power supply means of a low battery.

[0008] In the 1st power output unit of such this invention, while carrying out drive control of said 1st motor, it shall have the 1st drive accumulation-of-electricity control means which controls the accumulation-of-electricity condition of said accumulation-of-electricity means. In the 1st power output unit of this invention of this mode said 1st drive accumulation-of-electricity control means Shall be a means to control switching of two or more of said switching elements of said 1st inverter circuit to adjust the charge and discharge of said accumulation-of-electricity means while adjusting said polyphase current impressed to said 1st motor, or While the polyphase current in which the output of target power is possible is impressed to this 1st motor from said 1st motor, it shall be a means to control switching of two or more of said switching elements of said 1st inverter circuit so that the electrical potential difference between terminals of said accumulation-of-electricity means turns into a target electrical potential difference.

[0009] Moreover, in the 1st power output unit of this invention, it shall have the 2nd electric power supply means connected at the bus-bar of the either the positive-electrode bus-bar of said 2nd inverter circuit or the negative-electrode bus-bars, and the neutral point of said 2nd motor. If it carries out like this, an accumulation-of-electricity means can be charged using the power of the 2nd electric power supply means.

[0010] In the 1st power output unit of this invention of a mode equipped with such 2nd electric power supply means, while carrying out drive control of said 2nd motor, it shall have the 2nd drive accumulation-of-electricity control means which controls the accumulation-of-electricity condition of said accumulation-of-electricity means. In the 2nd power output unit of this invention of this mode said 2nd drive accumulation-of-electricity control means Shall be a means to control switching of two or more of said switching elements of said 2nd inverter circuit to adjust the charge and discharge of said accumulation-of-electricity means while adjusting said polyphase current impressed to said 2nd motor, or While the polyphase current in which the output of target power is possible is impressed to this 2nd motor from said 2nd motor, it shall be a means to control switching of two or more of said switching elements of said 2nd inverter circuit so that the electrical potential difference between terminals of said accumulation-of-electricity means turns into a target electrical potential difference.

[0011] The 1st motor which the 2nd power output unit of this invention is a power output unit in which the output of power is possible, and carries out a rotation drive by the polyphase current, Polyphase current power by switching actuation of two or more switching elements The 1st inverter circuit which can be supplied to said 1st motor, The 1st electric power supply means connected at the bus-bar of the either the positive-electrode bus-bar of this 1st inverter circuit or the negative-electrode bus-bars, and the neutral point of said 1st motor, A positive-electrode bus-bar and a negative-electrode bus-bar are connected to the 2nd motor which carries out a rotation drive by the polyphase current, and the positive-electrode bus-bar and negative-electrode bus-bar of said 1st inverter circuit. Polyphase current power by switching actuation of two or more switching elements The 2nd inverter circuit which can be supplied to said 2nd motor, Let it be a summary to have the 1st accumulation-of-electricity means which was connected at the bus-bar of another side to which said 1st electric power supply means of the positive-electrode bus-bar of said 1st inverter circuit and the negative-electrode bus-bars was not connected, and the neutral point of said 1st motor and in which charge and discharge are possible.

[0012] In the 2nd power output unit of this this invention, the 1st electric power supply means is connected at the bus-bar of the either the positive-electrode bus-bar of the 1st inverter circuit or the negative-electrode bus-bars, and the neutral point of a motor. Since it connects at the bus-bar of another side to which the 1st electric power supply means of the positive-electrode bus-bar of the 1st inverter circuit and the negative-electrode bus-bars was not connected, and the neutral point of the 1st motor, the 1st accumulation-of-electricity means in which charge and discharge are possible The 1st electric power supply means and the 1st accumulation-of-electricity means will have connected the 1st positive-electrode bus-bar and negative-electrode bus-bar of an inverter circuit to a serial, can consider that the 1st electric power supply means and

the 1st accumulation-of-electricity means are the power sources of one, and can drive the 1st motor and the 2nd motor. The circuit which consists of a coil of each phase of the 1st motor and a switching element of each phase of the 1st inverter circuit can charge the 1st accumulation-of-electricity means using the power of the 1st electric power supply means by switching actuation of the switching element of the 1st inverter circuit, and can perform charge of the 1st accumulation-of-electricity means, and the drive of the 1st motor to coincidence by synchronizing with the switching actuation in the case of the drive of the switching actuation of the 1st motor. Moreover, the 2nd motor can be driven independently with the 1st motor by considering that the 1st electric power supply means and the 1st accumulation-of-electricity means are the power sources of one, and carrying out switching actuation of the switching element of the 2nd inverter circuit. And since pressure-proofing of the 1st accumulation-of-electricity means serves as a value which subtracted the electrical potential difference of the 1st electric power supply means from the electrical potential difference required for the drive of the 1st motor or the 2nd motor, it can be made lower than the electrical potential difference of the positive-electrode bus-bar of the 1st inverter circuit, and a negative-electrode bus-bar. Consequently, while being able to attain miniaturization of the 1st accumulation-of-electricity means, and low cost-ization, i.e., a miniaturization and low-cost-izing of equipment, improvement in endurance or stabilization can be aimed at with the reduction in pressure-proofing of the 1st accumulation-of-electricity means.

[0013] In the 2nd power output unit of such this invention, while carrying out drive control of said 1st motor, it shall have the 1st drive accumulation-of-electricity control means which controls the accumulation-of-electricity condition of said 1st accumulation-of-electricity means. In the 2nd power output unit of this invention of this mode said 1st drive accumulation-of-electricity control means Shall be a means to control switching of two or more of said switching elements of said 1st inverter circuit to adjust the charge and discharge of said 1st accumulation-of-electricity means while adjusting said polyphase current impressed to said 1st motor, or While the polyphase current in which the output of target power is possible is impressed to this 1st motor from said 1st motor It shall be a means to control switching of two or more of said switching elements of said 1st inverter circuit so that the electrical potential difference between terminals of said 1st accumulation-of-electricity means turns into a target electrical potential difference.

[0014] Moreover, the 2nd electric power supply means connected in the 2nd power output unit of this invention at the bus-bar of the either the positive-electrode bus-bar of said 2nd inverter circuit or the negative-electrode bus-bars, and the neutral point of said 2nd motor, It shall have the 2nd accumulation-of-electricity means which was connected at the bus-bar of another side to which said 2nd electric power supply means of the positive-electrode bus-bar of said 2nd inverter circuit and the negative-electrode bus-bars was not connected, and the neutral point of said 2nd motor and in which charge and discharge are possible. If it carries out like this, the 2nd electric power supply means will be connected at the bus-bar of the either the positive-electrode bus-bar of the 2nd inverter circuit or the negative-electrode bus-bars, and the neutral point of a motor. Since it connects at the bus-bar of another side to which the 2nd electric power supply means of the positive-electrode bus-bar of the 2nd inverter circuit and the negative-electrode bus-bars was not connected, and the neutral point of the 2nd motor, the 2nd accumulation-of-electricity means in which charge and discharge are possible The 2nd electric power supply means and the 2nd accumulation-of-electricity means will have connected the 2nd positive-electrode bus-bar and negative-electrode bus-bar of an inverter circuit to a serial, can consider that the 2nd electric power supply means and the 2nd accumulation-of-electricity means are the power sources of one, and can drive the 1st motor and 2nd motor. The circuit which consists of a coil of each phase of the 2nd motor and a switching element of each phase of the 2nd inverter circuit can charge the 2nd accumulation-of-electricity means using the power of the 2nd electric power supply means by switching actuation of the switching element of the 2nd inverter circuit, and can perform charge of the 2nd accumulation-of-electricity means, and the drive of the 2nd motor to coincidence by synchronizing with the switching actuation in the case of the drive of the switching actuation of the 2nd motor. Moreover, the 1st motor can be driven independently with the 2nd motor by considering that the 2nd electric power supply means and the 2nd accumulation-of-electricity means are the power sources of one, and carrying out switching actuation of the switching element of the 1st inverter circuit. And pressure-proofing of the 2nd accumulation-of-electricity means can be made lower than the electrical potential difference of the positive-electrode bus-bar of the 2nd inverter circuit, and a negative-electrode bus-bar like the 1st accumulation-of-electricity means. Thus, by having the 2nd electric power supply means and the 2nd accumulation-of-electricity means in addition to the 1st electric power supply means and the 2nd accumulation-of-electricity means, multiplexing of a power source can be attained and power stabilized more can be outputted.

[0015] In the 2nd power output unit of this invention of a mode equipped with such 2nd electric power supply means and the 2nd accumulation-of-electricity means, while carrying out drive control of said 2nd motor, it shall have the 2nd drive accumulation-of-electricity control means which controls the accumulation-of-electricity condition of said 2nd accumulation-of-electricity means. In the 2nd power output unit of this invention of this mode said 2nd drive accumulation-of-electricity control means Shall be a means to control switching of two or more of said switching elements of said 2nd inverter circuit to adjust the charge and discharge of said 2nd accumulation-of-electricity means while adjusting said polyphase current impressed to said 2nd motor, or While the polyphase current in which the output of target power is possible is impressed to this 2nd motor from said 2nd motor It shall be a means to control switching of two or more of said switching elements of said 2nd inverter circuit so that the electrical potential difference between terminals of said 2nd accumulation-of-electricity means turns into a target electrical potential difference.
[0016] Moreover, in the 2nd power output unit of this invention, it shall have the 3rd accumulation-of-electricity means which was connected to said the 1st positive-electrode bus-bar and negative-electrode bus-bar of an inverter circuit and in which charge and discharge are possible.
[0017] In the 1st of this invention, or the 2nd power output unit, said the 1st motor and/or said 2nd motor are a generator motor which can be generated by the input of power. Said 1st electric power supply means is a means in which charge and discharge are possible. While driving said the 1st motor and/or said 2nd motor as a generator So that said 1st electric power supply means may be charged using the power generated by the motor driven as this generator It shall have the 1st charge control means which controls switching of the switching element of said 1st inverter circuit and/or said 2nd inverter circuit. If it carries out like this, since the generation of electrical energy by the output of power and power can be performed if needed, it can consider as equipment with the high use effectiveness of energy. In the mode which is the 1st of this invention of this mode, or the 2nd power output unit, and is equipped with the 2nd electric power supply means Said 2nd electric power supply means is a means in which charge and discharge are possible. While driving said the 1st motor and/or said 2nd motor as a generator So that said 2nd electric power supply means may be charged using the power generated by the motor driven as this generator It shall have the 2nd charge control means which controls switching of the switching element of said 1st inverter circuit and/or said 2nd inverter circuit. If it carries out like this, since the generation of electrical energy by the output of power and power can be performed further if needed, it can consider as the higher equipment of the use effectiveness of energy.
[0018]
[Other modes of invention] This invention can also take the following modes besides an above-mentioned mode.
[0019] The 1st motor which the power output unit of other modes is a power output unit in which the output of power is possible, and carries out a rotation drive by the polyphase current of the 1st carrier frequency, The 2nd motor which carries out a rotation drive by the polyphase current of the 2nd carrier frequency, The power inverter circuit transformed into the polyphase current power with which said the 1st carrier frequency and said 2nd carrier frequency come to mix direct current power by switching actuation of two or more switching elements, The changed this polyphase current power is distributed to the component of said 1st carrier frequency, and the component of said 2nd carrier frequency, and let it be a summary to have a power distribution means to supply the this distributed polyphase current power to said 1st corresponding motor and said 2nd motor.
[0020] With the power appearance equipment of other modes, it changes into the polyphase current power with which the 1st carrier frequency and 2nd carrier frequency come to mix direct current power by switching actuation of two or more switching elements in a power inverter circuit, and the polyphase current power distributed while the power distribution means distributed this changed polyphase current power to the component of the 1st carrier frequency and the component of the 2nd carrier frequency is supplied to the 1st corresponding motor and 2nd corresponding motor. Therefore, two motors can be driven in one power inverter circuit. Consequently, a miniaturization and low-cost-izing of equipment can be attained.
[0021] being such -- others -- voice -- said power distribution means shall be equipped with the 1st band pass filter which penetrates alternatively the component of said 1st carrier frequency of said changed polyphase current power, and the 2nd band pass filter which penetrates alternatively the component of said 2nd carrier frequency of said changed polyphase current power in a power output unit [like]
[0022]
[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained using an

example. Drawing 1 is the block diagram showing the outline of the configuration of the power output unit 20 which is one example of this invention. The motor MG 1 which carries out a rotation drive by the three-phase alternating current so that the power output unit 20 of an example may be illustrated Direct current power is changed into three-phase-alternating-current power. The inverter circuit INV1 which can be supplied to a motor MG 1, The motor MG 2 and direct current power which carry out a rotation drive by the three-phase alternating current are changed into three-phase-alternating-current power. The inverter circuit INV2 which can be supplied to a motor MG 2, DC power supply 30 connected at the negative-electrode bus-bar 24 of an inverter circuit INV1 and an inverter circuit INV2, and the neutral point of a motor MG 1, It has the capacitor 32 connected to the positive-electrode bus-bar 22 and the negative-electrode bus-bar 24 of an inverter circuit INV1 and an inverter circuit INV2, and the electronic control unit 40 which controls the whole equipment.

[0023] Both the motors MG1 and MG2 are constituted as a synchronous generator motor which consists of stators around which Rota where the permanent magnet was stuck on the outside surface, for example, and a three phase coil were wound and which can be generated. The revolving shaft of a motor MG 1 is the output shaft of the power output unit 20 of an example, and power is outputted from this revolving shaft. The revolving shaft of a motor MG 2 is connected to the output shaft and indirect target of the power output unit 20 of an example, and the power from a motor MG 2 can also be indirectly outputted now to the output shaft of the power output unit 20. In addition, since it is constituted as a generator motor, the motors MG1 and MG2 of an example can be generated by motors MG1 and MG2, if power is inputted into the revolving shaft of motors MG1 and MG2.

[0024] Both the inverter circuits INV1 and INV2 are constituted by six diodes D11-D16, and D21-D26. [six transistors T11-T16, T21-T26, and] Six transistors T11-T16, and two T21-T26 are arranged at a time in a pair so that it may become a source and sink side to the positive-electrode bus-bar 22 and the negative-electrode bus-bar 24, respectively, and each of the three phase coil (uvw) of motors MG1 and MG2 is connected at the node. Therefore, if the rate of transistors T11-T16 and the ON time amount of T21-T26 of making a pair is controlled by the condition that the electrical potential difference is acting on the positive-electrode bus-bar 22 and the negative-electrode bus-bar 24, rotating magnetic field can be formed with the three phase coil of motors MG1 and MG2, and the rotation drive of the motors MG1 and MG2 can be carried out. Since switching control of the transistors T11-T16 of an inverter circuit INV1 and switching control of the transistors T21-T26 of an inverter circuit INV2 can be performed independently, they can carry out drive control of the motors MG1 and MG2 independently respectively.

[0025] The electronic control unit 40 is constituted as a microprocessor centering on CPU42, and is equipped with ROM44 which memorized the processing program, RAM46 which memorizes data temporarily, and input/output port (not shown). In this electronic control unit 40 A motor MG 1 The neutral point current from the current sensors 51-53 attached in each phase of uvw of the three phase coil of MG2, and the current sensor 54 attached at the current of each phase from 61-63, or the neutral point of a motor MG 1, the angle-of-rotation sensor 56 attached in the revolving shafts of motors MG1 and MG2, The command value about actuation of the electrical potential difference Vc between terminals and Motor MG 1 of the capacitor 32 from a voltage sensor 68 attached in the angle of rotation of the rotator of the motors MG1 and MG2 from 66 and the capacitor 32, and a motor MG 2 etc. is inputted through input port. Moreover, from the electronic control unit 40, the control signal for performing the transistors T11-T16 of inverter circuits INV1 and INV2 and switching control of T21-T26 etc. is outputted through the output port.

[0026] Drawing 2 is some circuit diagrams of the power output unit 20 of the example which paid its attention to u phase of the three phase coil of a motor MG 1. Considering the condition of having set the transistor T12 of u phase of an inverter circuit INV1 to ON now, in this condition, the short circuit shown by the drawing destructive line arrow head is formed, and u phase of the three phase coil of a motor MG 1 functions as a reactor. If a transistor T12 is turned off from this condition, the energy stored in u phase of the three phase coil which is functioning as a reactor will be stored in a capacitor 32 by the charge circuit shown by the drawing solid line arrow head. The electrical potential difference in that case becomes higher than the supply voltage of DC power supply 30. On the other hand, DC power supply 30 can also be charged in this circuit using the potential of a capacitor 32. Therefore, it can be considered using the potential of a capacitor 32 that it is the step-down and step-up chopper circuit which can charge DC power supply 30 while this circuit carries out the pressure up of the energy of DC power supply 30 to a capacitor 32 and stores it in it. Since it can consider that vw phase of the three phase coil of a motor MG 1 as well as u phase is a step-down and step-up chopper circuit, by turning on and off transistors T12, T14, and T16, a capacitor 32 can be charged or DC power supply 30 can be charged using the potential of a capacitor 32.

[0027] Although the potential difference arises between the terminals of a capacitor 32 by such charge, the potential difference is controllable by adjusting the current passed in the amount of the charge stored in a capacitor 32, i.e., a reactor. Therefore, the electrical potential difference Vc between terminals of a capacitor 32 can also be made into the supply voltage Vb twice the value of DC power supply 30. thus, if the electrical potential difference Vc between terminals of a capacitor 32 is made into the supply voltage Vb twice the value of DC power supply 30, in the power output unit 20 shown in drawing 1 It will be in the condition that the supply voltage Vb twice the electrical potential difference of DC power supply 30 by the capacitor 32 acts on the positive-electrode bus-bar 22 and the negative-electrode bus-bar 24. Motors MG1 and MG2 can be independently driven by carrying out switching control of the transistors T11-T16 of inverter circuits INV1 and INV2, and T21-T26.

[0028] Here, since what is necessary is just to supply the false three-phase alternating current by the switching control of the transistors T11-T16 which constitute an inverter circuit INV1 in the three phase coil of a motor MG 1 in order to drive a motor MG 1, a dc component can also be added to the three-phase alternating current. That is, the potential of the false three-phase alternating current is offset to a plus or minus side. Thus, if the three-phase alternating current which added the dc component is supplied to a motor MG 1, the rotation drive of the motor MG 1 can be carried out of an alternating current component, and a capacitor 32 can be charged as the dc component explained using drawing 2 . That is, the capacitor 32 can be charged while driving a motor MG 1. At this time, the electrical potential difference Vc between terminals of a capacitor 32 is controllable by adjusting the magnitude of a dc component.

[0029] Next, actuation of the power output unit 20 of the example constituted in this way is explained. Drawing 3 is an explanatory view which illustrates the operation block at the time of calculating the control signal outputted to inverter circuits INV1 and INV2 with the electronic control unit 40 of the power output unit 20 of an example. The motor MG plane 1 current command value setting section M1 which sets up the phase current command value of a motor MG 1 based on the operating-command value of the motor MG 1 into which an operation block is inputted so that it may illustrate, The phase potential command value operation part M2 for motor MG1 actuation which calculates the phase potential command value for actuation of a motor MG 1 (phase potential command value of an alternating current component) based on each phase current of the motor MG 1 from current sensors 51-53, the neutral point current from a current sensor 54, and the phase current command value of a motor MG 1, The motor MG2 phase-current command value setting section N1 which sets up the phase current command value of a motor MG 2 based on the operating-command value of the motor MG 2 inputted, The phase potential command value operation part N2 for motor MG2 actuation which calculates the phase potential command value for actuation of a motor MG 2 based on each phase current of the motor MG 2 from current sensors 61-63, and the phase current command value of a motor MG 2, The PWM signal transformation section N6 for inverters INV2 which changes the phase potential command value for actuation of a motor MG 2 into an PWM signal, and is outputted to an inverter circuit INV2, It is based on the rotational frequency of the rotator of a motor MG 1 and the phase current command value of a motor MG 1 and a motor MG 2 which are acquired based on the angle of rotation from the angle-of-rotation sensor 56. As an electrical-potential-difference command value between the positive-electrode bus-bar 22 and the negative-electrode bus-bar 24 The inverter input voltage command value operation part M3 which calculates a ** inverter input voltage command value, The phase potential command value operation part M4 for inverter input voltage adjustment which sets up the phase potential command value for inverter input voltage accommodation (phase potential command value of a dc component) based on the electrical potential difference Vc between terminals of the capacitor 32 from a voltage sensor 68, and an inverter input voltage command value, The phase potential command value adder unit M5 adding the phase potential command value for actuation of the motor MG 1 as an alternating current component, and the phase potential command value for inverter input voltage adjustment as a dc component, It consists of the PWM signal transformation sections M6 for inverters INV1 which change into an PWM signal the phase potential command value to which the alternating current component and the dc component were added, and are outputted to an inverter circuit INV1. While controlling the electrical potential difference Vc between terminals of a capacitor 32 by such operation block, with it, independent drive control with a motor MG 1 and a motor MG 2 is enabled.

[0030] Drawing 4 is the block diagram showing the outline of the configuration at the time of applying the power output unit 20 of an example as some power output units 10 of a car. This power output unit 10 for cars is equipped with the power output unit 20 of an example which connects a motor MG 1 to the driving shaft 12 connected to the ring wheel of planetary gear PG, and the electronic control unit 16 which controls the power output unit 10 whole for cars while it connects a motor MG 2 to the revolving shaft connected to

the sun gear of the planetary gear PG by which carrier connection was made, and planetary gear PG at the engine EG as an internal combustion engine, and the crankshaft 11 of Engine EG. The driving shaft 12 is connected to driving wheels 14 and 15 through the differential gear 13, and, finally the power outputted to the driving shaft 12 is outputted to driving wheels 14 and 15. Although the power output unit 20 of an example can also be outputted to the direct-drive shaft 12 by the motor MG 2 using the power from DC power supply 30, by planetary gear PG, it carries out torque conversion of the power outputted from Engine EG, and can output it to a driving shaft 12. That is, Engine EG is operated on the efficient operation point, the rotational frequency and torque are changed into the rotational frequency and torque of a driving shaft 12, and it outputs to a driving shaft 12. Therefore, if needed, it drives as a motor or motors MG1 and MG2 are driven as a generator. Under the present circumstances, it will charge also by the motor which functions as a generator, and the electrical potential difference Vc between that terminal can control a capacitor 32 by the exchange of the energy of a capacitor 32 and DC power supply 30. In addition to actuation of such torque conversion, using a part of power from Engine EG, DC power supply 30 can be charged or power can also be added to a driving shaft 12 using the power from DC power supply 30 with torque conversion of the power from Engine EG. Moreover, in case damping force is made to act on driving wheels 14 and 15, DC power supply 30 can also be charged with the power obtained by carrying out regenerative control of the motor MG 1.

[0031] According to the power output unit 20 of an example explained above, by carrying out switching control of the transistors T11-T16 of an inverter circuit INV1, while controlling the electrical potential difference Vc between terminals of a capacitor 32, drive control of the motor MG 1 can be carried out. Moreover, drive control of the motor MG 2 can be carried out independently of a motor MG 1 by carrying out switching control of the transistors T21-T26 of an inverter circuit INV2. And since the pressure up of the capacitor 32 connected to the positive-electrode bus-bar 22 and the negative-electrode bus-bar 24 of inverter circuits INV1 and INV2 is carried out using the energy of DC power supply 30 and it charges, supply voltage Vb of DC power supply 30 can be made lower than an electrical potential difference required for the drive of a motor 22. Since the electrical potential difference Vc between terminals of a capacitor 32 is controllable, it can be made into a more suitable value according to the drive of a motor MG 1 and a motor MG 2. Consequently, the energy efficiency of equipment can be raised.

[0032] Although DC power supply 30 were connected in the power output unit 20 of an example at the negative-electrode bus-bar 24 of inverter circuits INV1 and INV2, and the neutral point of a motor MG 1, as shown in power output unit 20B of the modification illustrated to drawing 5 , it is good for the positive-electrode bus-bar 22 of inverter circuits INV1 and INV2, and the neutral point of a motor MG 1 also as what connects DC-power-supply 30B. Also by power output unit 20B of this modification, while controlling the electrical potential difference Vc between terminals of capacitor 32B by switching control of transistors T11-T16, by it, drive control of the motor MG 1 can be carried out.

[0033] Although DC power supply 30 were connected in the power output unit 20 of an example at the negative-electrode bus-bar 24 of inverter circuits INV1 and INV2, and the neutral point of a motor MG 1, as shown in power output unit 20C of the modification illustrated to drawing 6 , it is good also as what connects DC power supply 70 at the negative-electrode bus-bar 24 of inverter circuits INV1 and INV2, and the neutral point of a motor MG 2 in addition to the configuration of the power output unit 20 of an example. In power output unit 20C of this modification, by the switching control of the transistors T21-T26 of an inverter circuit INV2, while controlling the electrical potential difference Vc between terminals of a capacitor 32, drive control of the motor MG 2 can be carried out. That is, in power output unit 20C of a modification, a capacitor 32 can be charged with the both sides of switching control with the transistors T11-T16 of an inverter circuit INV1, and switching control with the transistors T21-T26 of an inverter circuit INV2. In addition, since DC power supply 30 may be attached so that the positive-electrode bus-bar 22 and the neutral point of a motor MG 1 may be connected as power output unit 20B of the modification illustrated to drawing 5 explained, you may attach so that the neutral point of the motor which corresponds either or the both sides of DC power supply 30 and DC power supply 70 with the positive-electrode bus-bar 22 may be connected.

[0034] Next, the power output unit 120 as the 2nd example of this invention is explained. Drawing 7 is the block diagram showing the outline of the configuration of the power output unit 120 of the 2nd example. The power output unit 120 of the 2nd example is carrying out the same configuration as the power output unit 20 of the 1st example except for the point that arrangement of a capacitor 132 differs so that it may illustrate. Therefore, the sign same about the same configuration as the configuration of the power output unit 20 of the 1st example is attached among the configurations of the power output unit 120 of the 2nd

example, and the explanation is omitted. In the power output unit 120 of the 2nd example, the capacitor 132 is attached so that the positive-electrode bus-bar 22 of inverter circuits INV1 and INV2 and the neutral point of a motor MG 1 may be connected.

[0035] Drawing 8 is some circuit diagrams of the power output unit 120 of the 2nd example which paid its attention to u phase of the three phase coil of a motor MG 1. Considering the condition of having set the transistor T12 of u phase of an inverter circuit INV1 to ON now, in this condition, the short circuit shown by the drawing destructive line arrow head is formed, and u phase of the three phase coil of a motor MG 1 functions as a reactor. If a transistor T12 is turned off from this condition, the energy stored in u phase of the three phase coil which is functioning as a reactor will be stored in a capacitor 132 by the charge circuit shown by the drawing solid line arrow head. DC power supply 130 can also be similarly charged using the potential of a capacitor 132 by on the other hand supposing that it is off from the condition which set the transistor T11 to ON in this circuit. It can be considered using the potential of a capacitor 132 that it is the chopper circuit which can charge DC power supply 130 while this circuit stores the energy of DC power supply 130 in a capacitor 132. Since it can consider that vw phase of the three phase coil of a motor MG 1 as well as u phase is a chopper circuit, by turning on and off transistors T11-T16, a capacitor 132 can be charged or DC power supply 130 can be charged using the potential of a capacitor 132.

[0036] Although the potential difference arises between the terminals of a capacitor 132 by such charge, the potential difference is controllable by adjusting the current passed in the amount of the charge stored in a capacitor 132, i.e., a reactor. Therefore, the electrical potential difference Vc between terminals of a capacitor 132 can also be made into the supply voltage Vb of DC power supply 130. thus, if the electrical potential difference Vc between terminals of a capacitor 32 is made into the supply voltage Vb of DC power supply 130, in the power output unit 120 shown in drawing 7 It will be in the condition that DC power supply twice the electrical potential difference of the supply voltage Vb of DC power supply 130 which consist of DC power supply 130 and a capacitor 132 were connected to the positive-electrode bus-bar 22 and the negative-electrode bus-bar 24. Motors MG1 and MG2 can be independently driven by carrying out switching control of the transistors T11-T16 of inverter circuits INV1 and INV2, and T21-T26.

[0037] Since the false three-phase alternating current by the switching control of the transistors T11-T16 which constitute an inverter circuit INV1 shall just be added to a dc component like the power output unit 20 of the 1st example, the drive control of a motor MG 1 and the charge control of a capacitor 132 in the power output unit 120 of such 2nd example should just offset the potential of the false three-phase alternating current to a plus or minus side. Therefore, the power output unit 120 of the 2nd example can also perform the transistors T11-T16 of inverter circuits INV1 and INV2, and switching control of T21-T26 using the operation block illustrated to drawing 3 .

[0038] According to the power output unit 120 of the 2nd example explained above, the same effectiveness as the effectiveness that the power output unit 20 of the 1st example does so, i.e., the effectiveness that the switching control of an inverter circuit INV1 can perform drive control for control and Motor MG 1 of the electrical potential difference Vc between terminals of a capacitor 132 to coincidence, the effectiveness which can carry out drive control of the motor MG 2 independently of a motor MG 1 by the switching control of an inverter circuit INV2, can be done so. And in the power output unit 120 of the 2nd example, since it considers as the condition of having connected the positive-electrode bus-bar 22 and the negative-electrode bus-bar 24 by the DC power supply which consist of a capacitor 132 and DC power supply 130, pressure-proofing of a capacitor 132 can be made smaller than pressure-proofing of the capacitor 32 of the 1st example. Consequently, the miniaturization of equipment, low-cost-izing, endurance, and stability can be raised. In addition, it is applicable as some power output units 10 for cars which illustrate the power output unit 120 of such 2nd example as well as the power output unit 20 of the 1st example to drawing 4 .

[0039] Although it constituted from a power output unit 120 of the 2nd example so that the negative-electrode bus-bar 24 and the neutral point of a motor MG 1 might be connected by DC power supply 130 while connecting the positive-electrode bus-bar 22 and the neutral point of a motor MG 1 by the capacitor 132 As shown in power output unit 120B of the modification of drawing 9 , while connecting the positive-electrode bus-bar 22 and the neutral point of a motor MG 1 by DC-power-supply 130B, you may constitute so that the negative-electrode bus-bar 24 and the neutral point of a motor MG 1 may be connected by capacitor 132B. Also by power output unit 120B of this modification, while controlling the electrical potential difference Vc between terminals of capacitor 132B by switching control of transistors T11-T16, by it, drive control of the motor MG 1 can be carried out.

[0040] Although the positive-electrode bus-bar 22 and the negative-electrode bus-bar 24 of inverter circuits INV1 and INV2 were connected to the serial by the capacitor 132 and DC power supply 130 in the power

output unit 120 of the 2nd example, as shown in power output unit 120C of the modification of drawing 10 , it is good also as what forms the capacitor 170 which connects the positive-electrode bus-bar 26 and the negative-electrode bus-bar 28. If it carries out like this, surge absorption to the transistors T11-T16 of an inverter circuit INV1 or the transistors T21-T26 of an inverter circuit INV2 can be performed quickly. In addition, although it is very easy to be small [transistors T11-T16, the object for surge absorption of T21-T26, then its capacity] in this capacitor 170, the thing which stores energy like a capacitor 132, then its capacity become large.

[0041] Although the capacitor 132 was connected in the power output unit 120 of the 2nd example at the positive-electrode bus-bar 22 and the neutral point of a motor MG 1 while connecting DC power supply 130 at the negative-electrode bus-bar 24 of inverter circuits INV1 and INV2, and the neutral point of a motor MG 1 As shown in power output unit 120D of the modification illustrated to drawing 11 , it is good also as what connects DC power supply 140 at the negative-electrode bus-bar 24 of inverter circuits INV1 and INV2, and the neutral point of a motor MG 2 in addition to the configuration of the power output unit 120 of the 2nd example. In power output unit 120D of this modification, by the switching control of the transistors T21-T26 of an inverter circuit INV2, while controlling the electrical potential difference Vc between terminals of a capacitor 132, drive control of the motor MG 2 can be carried out. That is, in power output unit 120D of a modification, a capacitor 132 can be charged with the both sides of switching control with the transistors T11-T16 of an inverter circuit INV1, and switching control with the transistors T21-T26 of an inverter circuit INV2. In addition, since DC power supply 130 may be attached so that the positive-electrode bus-bar 22 and the neutral point of a motor MG 1 may be connected as power output unit 120B of the modification illustrated to drawing 9 explained, it is good also as what connects DC power supply 140 at the negative-electrode bus-bar 24 and the neutral point of a motor MG 2 in addition to the configuration of power output unit 120B of the modification of drawing 9 . Moreover, it is good also as what connects DC power supply 140 at the positive-electrode bus-bar 22 and the neutral point of a motor MG 2 in addition to the configuration of the power output unit 120 of the 2nd example, or the configuration of power output unit 120C of the modification of drawing 10 . Furthermore, as shown in power output unit 120E of the modification illustrated to drawing 12 , it is good also as what connects a capacitor 142 at the positive-electrode bus-bar 22 and the neutral point of a motor MG 2.

[0042] Although the power output unit 20 of the 1st example explained above, the power output unit 120 of the 2nd example, and its modification showed that it was applicable as some power output units 10 for cars, it is applicable as some of mobiles, such as vessels other than a car, and an aircraft, power output units of a non-portable device, or power output units.

[0043] Next, the power output unit 220 of the 3rd example of this invention is explained. Drawing 13 is the block diagram showing the outline of the configuration of the power output unit 220 of the 3rd example. The power output unit 220 of the 3rd example so that it may illustrate The direct current power from DC power supply 230 by carrying out switching actuation of the six transistors by the 1st carrier frequency The inverter circuit 232 changed into the mixed three-phase-alternating-current power which comes to mix the three-phase alternating current conveyed by the 2nd different carrier frequency from the three-phase alternating current conveyed and the 1st carrier frequency, The band pass filter 234 which takes out the 1st carrier frequency component from mixed three-phase-alternating-current power, and is supplied to a motor 236, It has the band pass filter 244 which takes out the 2nd carrier frequency component from mixed three-phase-alternating-current power, and is supplied to a motor 246, and the electronic control unit 250 which controls the whole equipment.

[0044] The motor 236,246 is constituted as a synchronous generator motor like the motors MG1 and MG2 of the 1st example. An inverter circuit 232 switches six transistors so that it may become the mixed three-phase alternating current which mixed the three-phase alternating current conveyed by the 1st carrier frequency at the time of driving a motor 236, and the three-phase alternating current conveyed by the 2nd carrier frequency which drives a motor 246 based on the control signal from an electronic control unit 250.

[0045] The electronic control unit 250 is constituted as a microprocessor centering on CPU252, and is equipped with ROM254 which memorized the processing program, RAM256 which memorizes data temporarily, and input/output port (not shown). A motor current from a current sensor 238,248, an operating-command value of a motor 236,246, etc. which were attached in the three phase coil of a motor 236,246 are inputted into this electronic control unit 250 through input port. Moreover, from the electronic control unit 250, the control signal to an inverter circuit 232 etc. is outputted through the output port. In an electronic control unit 250, the switching which forms the mixed three-phase alternating current which comes to mix the three-phase alternating current which it is conveyed by the three-phase alternating current

and the 2nd carrier frequency which it is conveyed by the 1st carrier frequency based on the operating-command value and motor current of a motor 236,246, and should be impressed to a motor 236, and should be impressed to a motor 246 is calculated, and it outputs to an inverter circuit 232 as a control signal. An inverter circuit 232 switches six transistors in response to this control signal.

[0046] According to the power output unit 220 of the 3rd example explained above, drive control of a motor 236 and the motor 246 can be carried out by one inverter circuit. Therefore, a miniaturization and low-cost-izing of equipment can be attained.

[0047] As mentioned above, although the gestalt of operation of this invention was explained using the example, as for this invention, it is needless to say that it can carry out with the gestalt which becomes various within limits which are not limited to such an example at all and do not deviate from the summary of this invention.

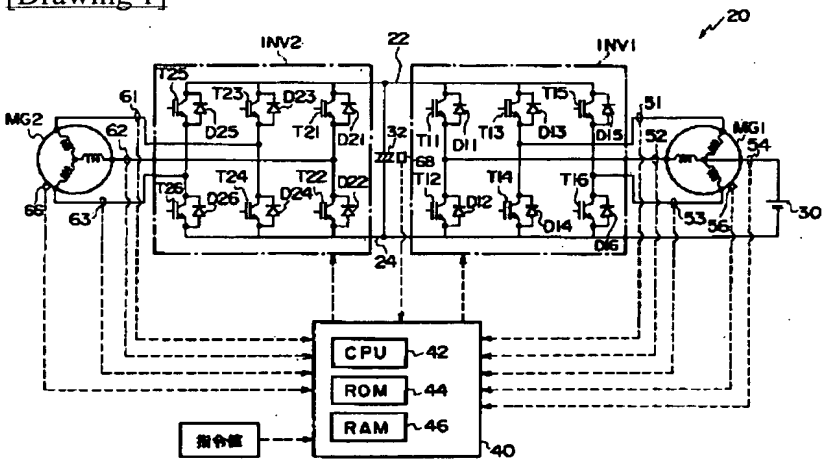
[Translation done.]

* NOTICES *

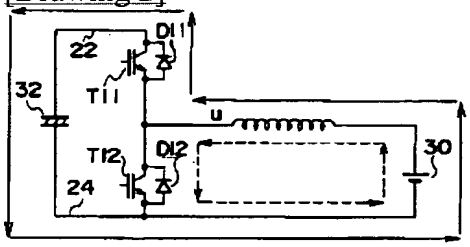
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

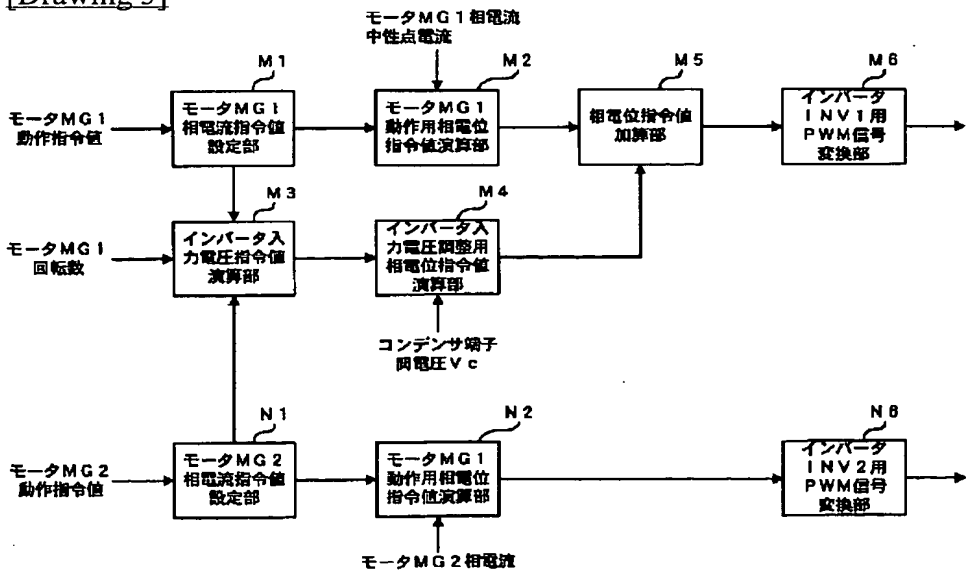
[Drawing 1]



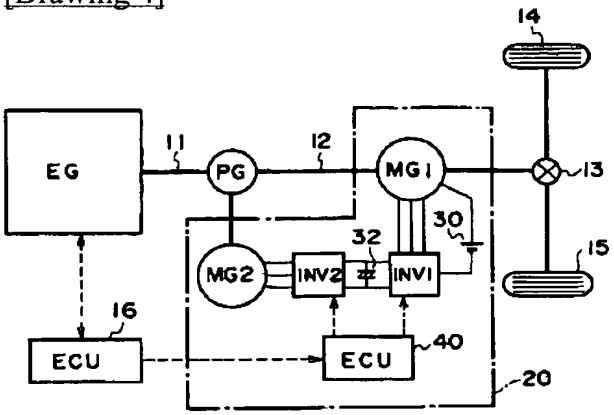
[Drawing 2]



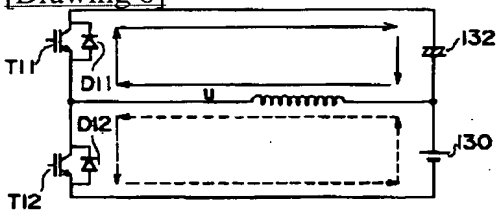
[Drawing 3]



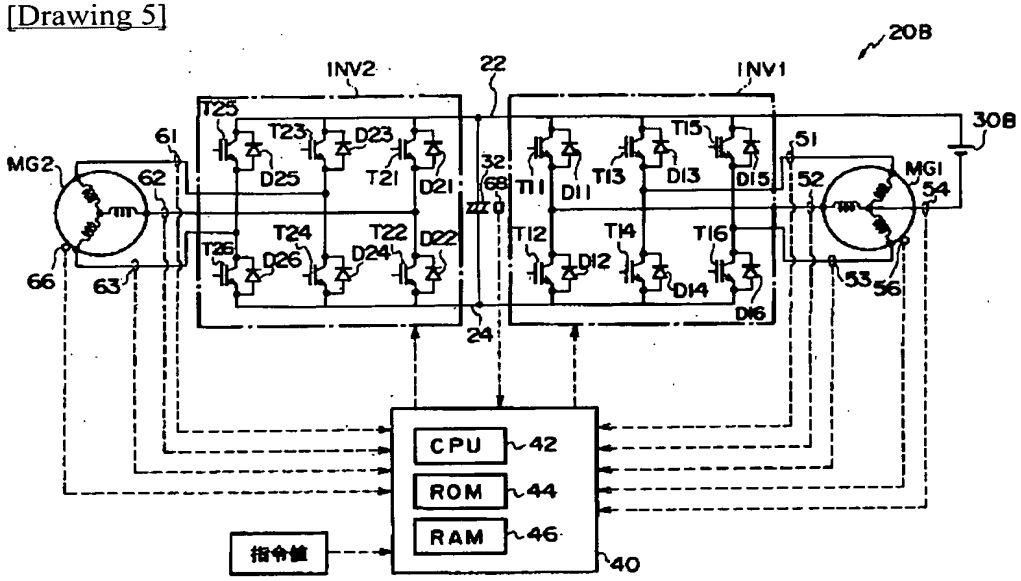
[Drawing 4]



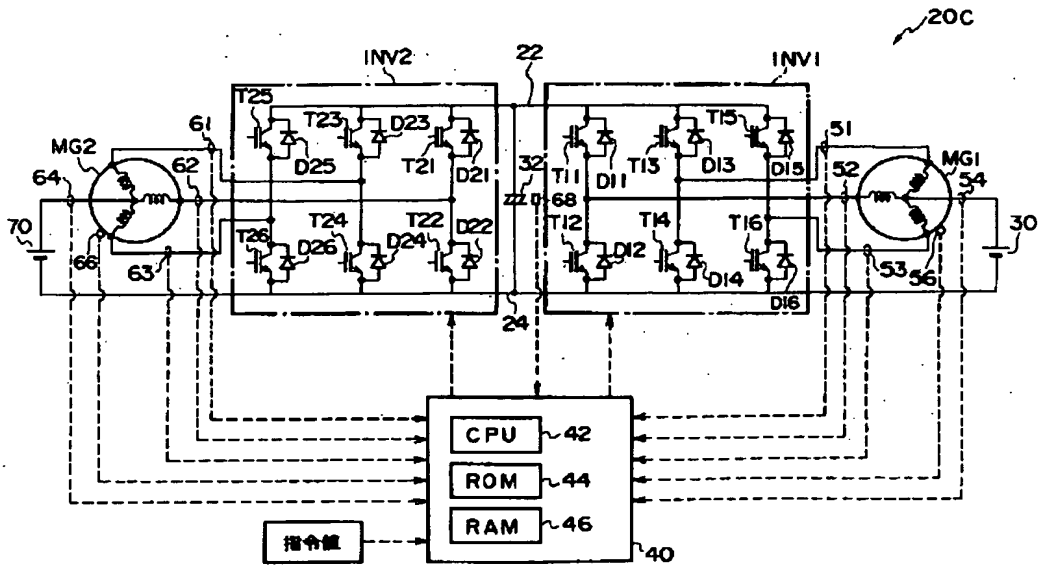
[Drawing 8]



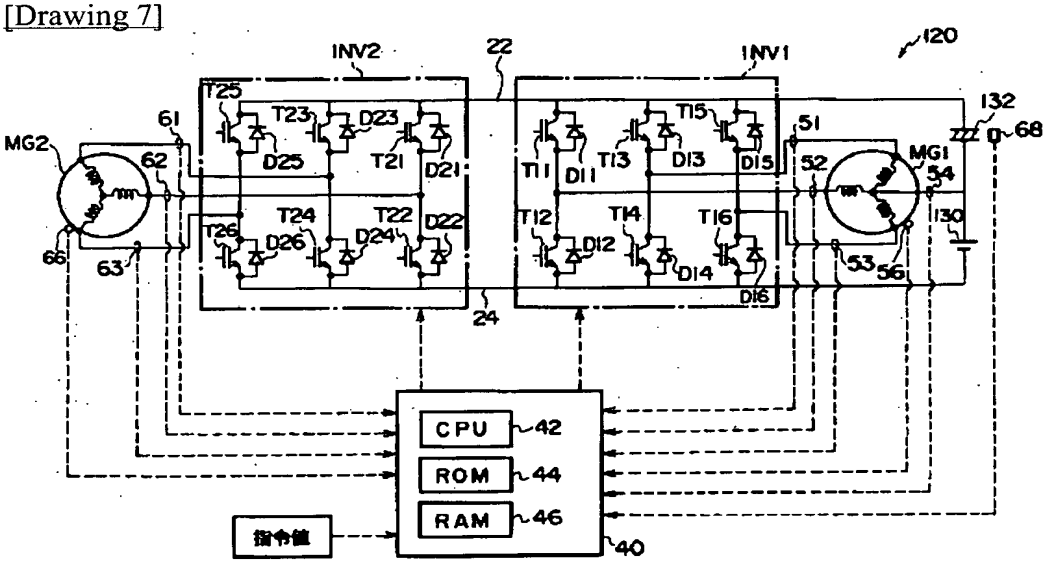
[Drawing 5]



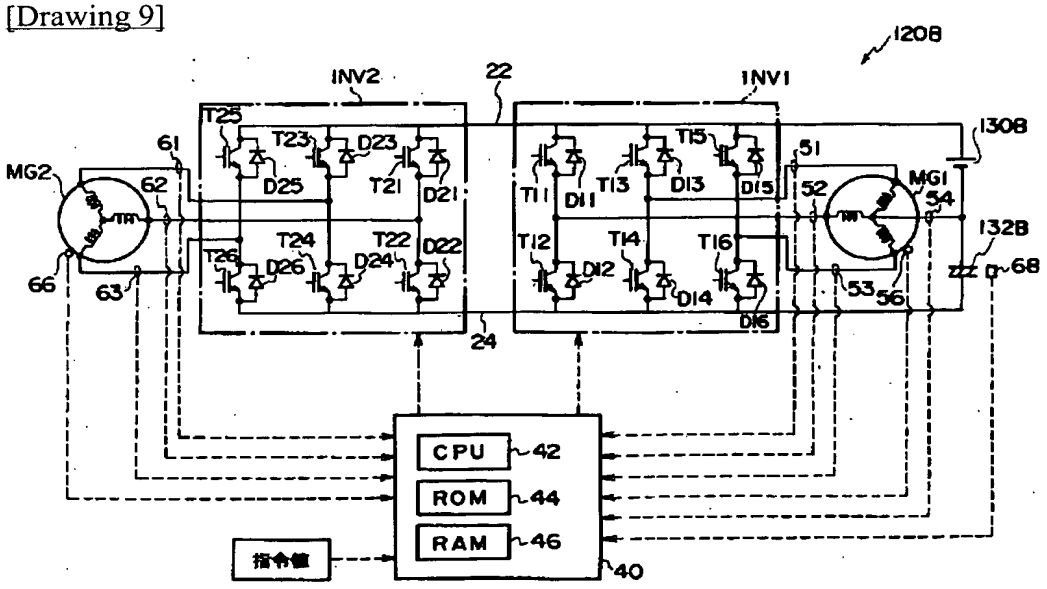
[Drawing 6]



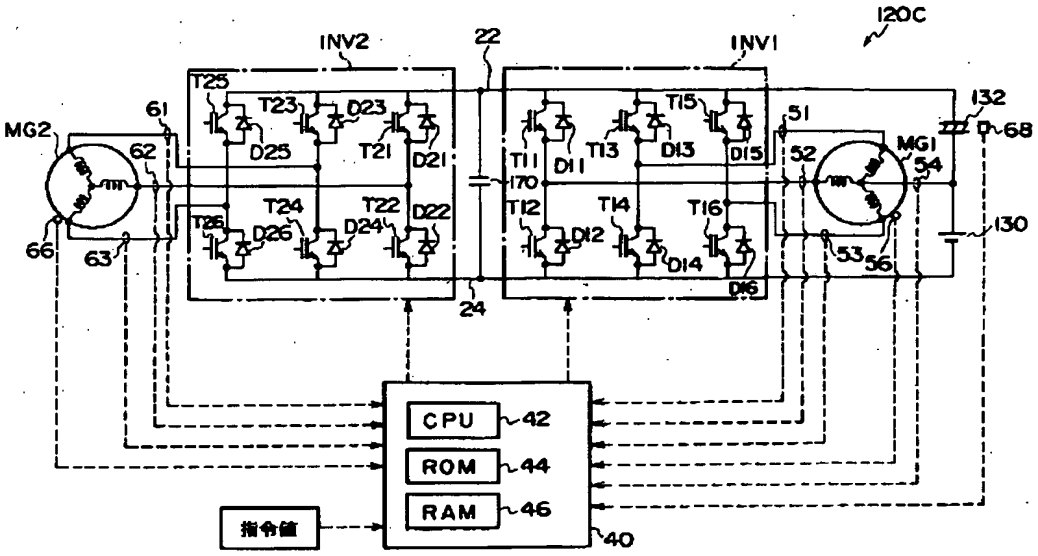
[Drawing 7]



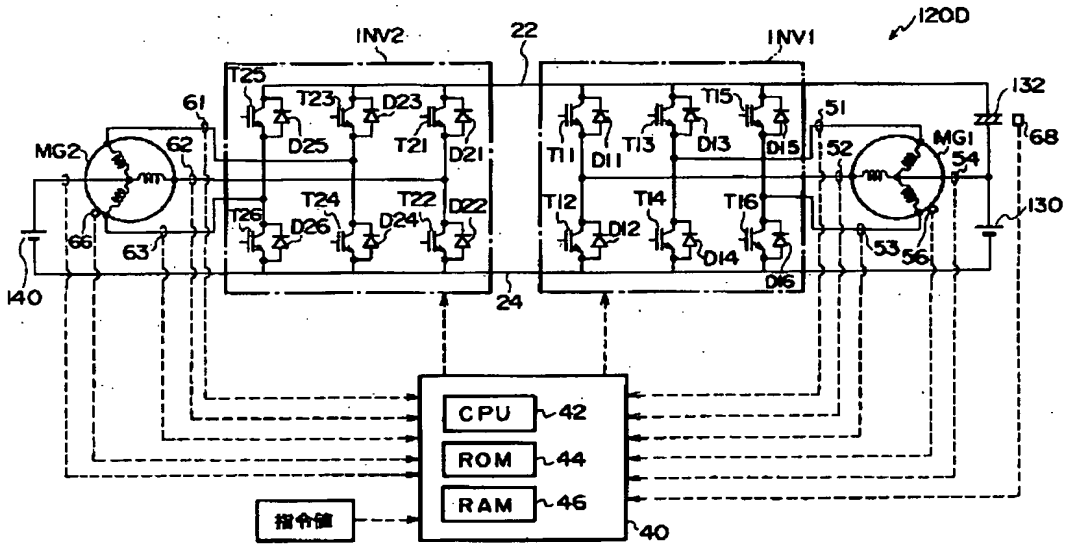
[Drawing 9]



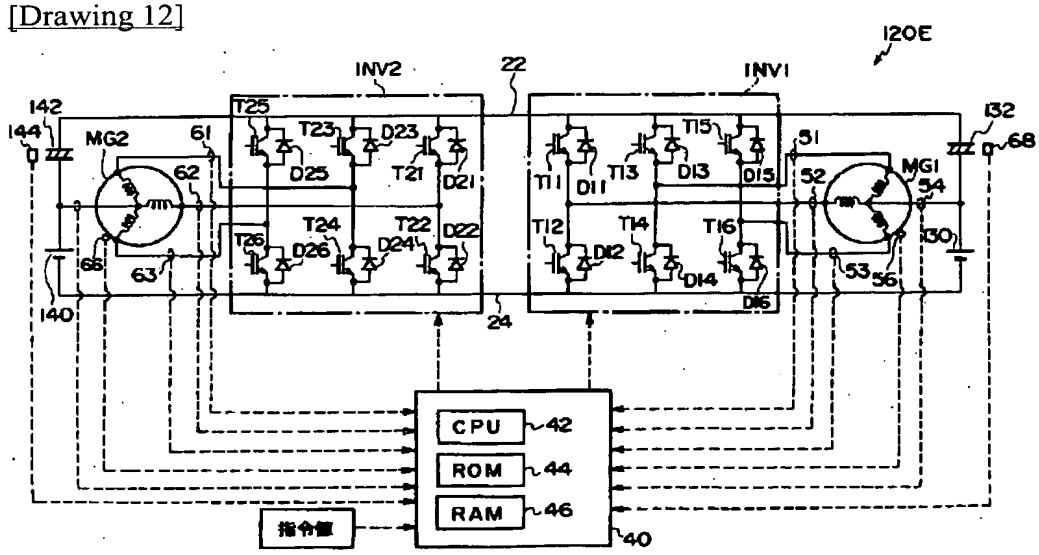
[Drawing 10]



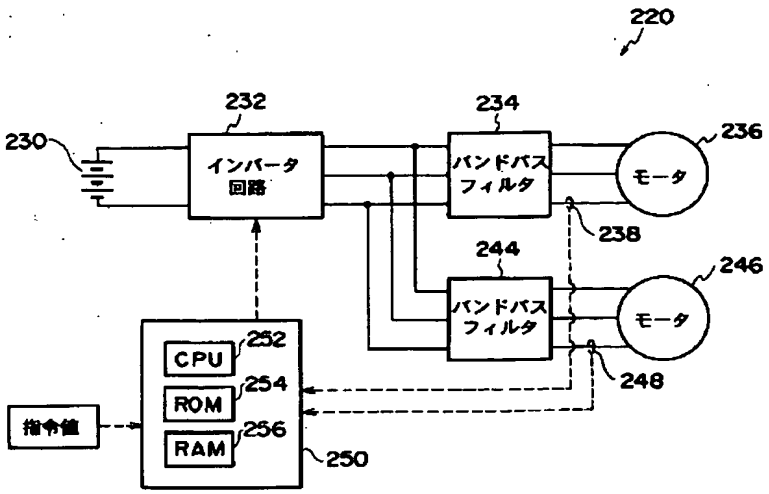
[Drawing 11]



[Drawing 12]



[Drawing 13]



[Translation done.]